DESCRIPTION

METHOD, PROGRAM AND TERMINAL DEVICE FOR RENDERING WEB
PAGE

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FIELD OF THE INVENTION

The present invention relates to a browser for browsing
contents on a network such as the Internet.

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BACKGROUND OF THE INVENTION

Recently, with the widespread use of the Internet as a
background, browsing contents described by a markup language
15 .such as an HTML (hypertext markup language) is performed on
various types of terminal devices, such as a mobile phone, a
PDA (personal digital assistant), a household electric
appliance and a car navigation system, as well as a personal
computer. In general, a software called a browser is used to
20 execute the browsing of contents.

Fig. 4 is a flowchart illustrating a rendering process
of a conventional browser running on a personal computer. As
shown in Fig. 4, the browser starts obtaining a web page
designated by a user through a network (step S11). In subsequent
25 steps S12 through S15, it is judged whether external cascading
style sheets (external CSS) and an external script are included
in the obtained web page (i.e., the obtained HTML document),

and thereafter the external CSS and the external script are

obtained if they are included in the obtained web page.

The "external CSS" means a CSS to be obtained through a

network. The "external script" means a script to be obtained

5   through a network.

When the external CSS is included in the obtained web page

(S12:YES), the external CSS is obtained through the network

(S13). Then, control proceeds to step S14. When the external

CSS is not included in the obtained web page (S12:NO), control

10   proceeds to step S14.

In step S14, it is judged whether the external script is

included in the obtained web page. When the external script is

included in the obtained web page (S14:YES), the external script

is obtained through the network (S15). Then, control proceeds

15   to step S16. When the external script is not included in the

obtained web page (S14:NO), control proceeds to step S16. In

step S16, rendering of the obtained web page (i.e., displaying

operation of the obtained web page) is executed.

As can be seen from the flowchart shown in Fig. 4, the

20   conventional browser does not perform displaying operation of

a web page until acquisition of external data (i.e., an external

CSS and an external script) is completed. That is, a screen image

of a web page designated by a user is not displayed on a screen

until a time period from step S11 to step S15 has elapsed. The

25   reason is that the style sheet and the script are data to be

applied to the entire web page to be processed, and therefore

the obtained web page can not be displayed as intended by a

designer of the web page until the external data is completely
obtained.

Accordingly, the user is required to wait until the
displaying of a web page is started at step S16 after the
5   designation of the web page.

In a publication, "Web technology with illustrations by
diagrams", Osamu Koizumi, Nihon Jitsugyo Publishing CO., LTD,
November 10, 2001, pages 131-136 and pages 140-142, a property
of a script is described. That is, it is disclosed in the
10 publication that the style sheet is information to be applied
to the entire web page.

W3C Recommendation concerning the style sheet is also
explained in detail in a publication, "W3C Recommendation
Cascading Style Sheet Level 1", which can be obtained from a
15 URL:http://www.w3.org/TR/CSS1.

It should be note that although in the flowchart in Fig.
4 the presence or absence of the external CSS and the external
script is judged in this order in accordance with a typical
structure of a web page. However, the order of designation of
20 the external CSS and the external script varies among web pages
because the order is decided by a designer's intention.
Therefore, modifications of the flowchart of Fig. 4 (e.g., a
modification in which the order of step S12 and step S14 is
reversed) can be made depending on the type of a targeted web
25 page.

SUMMARY OF THE INVENTION

The disadvantages of terminal devices such as a mobile

phone, a PDA, a vehicle-installed device and a

network-connected home appliance in comparison with a personal

5   computer are as follows:

a screen size is small;

data transmission speed is relatively low;

performance of a CPU (central processing unit) is low; and

memory size is small.

10   In the following, such a terminal device having the

disadvantages mentioned above will be referred to as a portable

device.

If the rendering process of the browser is executed on

such a portable device, the time period between the start of

15   acquisition of a web page (step S13) and the displaying of the

web page (step S16) becomes larger relative to a personal

computer because of the disadvantages of the portable device.

The processing rate of the browser becomes smaller particularly

for a web page targeted for a personal computer because the size

20   of contents (the web page) targeted for the personal computer

is typically large.

One of techniques for suppressing decrease of the

processing rate of the browser running on the portable device

is to skip the acquisition of external data, including an

25   external CSS, an external script and image data embedded in a

web page using, for example, an <img> tag (hereafter, referred

to as an embedded image data), so as to avoid data transmission

of a large amount of data which causes the decrease of processing rate of the browser. This technique corresponds to skipping at least one of step S13 and step S15 in the rendering process shown in Fig. 4.

5   Japanese Patent Publication NO. 2987355 discloses a technique to enhance processing rate of a browser. In this publication (specifically, in paragraphs 33 and 39 of this publication), the browser operates to skip acquisition of embedded images and to display icons in place of displaying the embedded images. By this technique, links (e.g., anchor tags designated as <a href= "···">) designated in a web page are displayed quickly. That is, this technique enables the browser to quickly transfer to a destination linked by an anchor tag.

Another technique for suppressing the decrease of a processing rate of a browser running on the portable device is to configure a browser to limit the functions of the browser regarding tags, attributes, CSS and a script. By this technique, the rendering process (i.e., a displayed image of a web page) is simplified, and thereby the decrease of the processing rate of the browser due to, for example, a low CPU speed, can be suppressed.

It is noted that although the above mentioned techniques can suppress the decrease of a processing rate of a rendering process for a web page, the web page can not be displayed as intended by a designer of the web page. That is, deterioration in quality of a web page is caused.

The present invention is advantageous in that it provides

a method and a terminal device for rendering a web page
configured to enhance sensuous processing rate sensible to a
user and to prevent deterioration in displaying quality of the
web page.

5   According to an aspect of the invention, there is provided
a method of rendering a page, which includes starting obtaining
operation for obtaining a page made by a markup language, and
performing a text browsing mode operation on obtained part of
data of the page in parallel with the obtaining operation of
10   the page. The method further includes judging whether or not
acquisition of definition information which is information to
be applied to the entire page so as to render the page as
designated by a markup language document of the page is finished,
and switching onscreen representation, depending on a result
15   of the judging, from onscreen representation in a text browsing
mode to onscreen representation in which the definition
information is applied.

With this configuration, sensuous processing rate of a
web page sensible to a user is enhanced while deterioration in
20   displaying quality of the web page is avoided.

According to another aspect of the invention, there is
provided a method of rendering a page, which includes starting
obtaining operation for obtaining a page made by a markup
language, and performing a text browsing mode operation on
25   obtained part of data of the page in parallel with the obtaining
operation of the page. The method further includes judging
whether or not data of a predetermined number's screenfulls

against the page is obtained, and switching onscreen representation, depending on a result of the judging, from onscreen representation in a text browsing mode to onscreen representation in which definition information designated in

5　a markup language document of the page and applied to the entire page so as to render the page as designated by the document is applied.

With this configuration, sensuous processing rate of a web page sensible to a user is enhanced while deterioration in

10　displaying quality of the web page is avoided.

According to another aspect of the invention, there is provided a method of rendering a page, which includes starting obtaining operation for obtaining a page made by a markup language, and performing a text browsing mode operation on

15　obtained part of data of the page in parallel with the obtaining operation of the page. The method further includes judging whether or not a predetermined time period has elapsed from a start of the obtaining operation, and switching onscreen representation, depending on a result of the judging, from

20　onscreen representation in a text browsing mode to onscreen representation in which definition information designated in a markup language document of the page and applied to the entire page so as to render the page as designated by the document is applied.

25　With this configuration, sensuous processing rate of a web page sensible to a user is enhanced while deterioration in displaying quality of the web page is avoided.

According to another aspect of the invention, there is
provided a method of rendering a page, which includes starting
obtaining operation for obtaining a page made by a markup
language, and performing a text browsing mode operation on
5   obtained part of data of the page in parallel with the obtaining
operation of the page. The method further includes judging
whether or not predetermined user operation is performed, and
switching onscreen representation, depending on a result of the
judging, from onscreen representation in a text browsing mode
10 to onscreen representation in which definition information
designated in a markup language document of the page and applied
to the entire page so as to render the page as designated by
the document is applied.

With this configuration, sensuous processing rate of a
15 web page sensible to a user is enhanced while deterioration in
displaying quality of the web page is avoided.

Optionally, the predetermined user operation may include
operation for canceling the switching of the onscreen
representation. In this case, the switching of the onscreen
20 representation may be cancelled if it is judged that the
predetermined user operation is performed, and the switching
of the onscreen representation may be performed if it is judged
that the predetermined user operation is not performed.

. Still optionally, the switching may be controlled in
25 three stages including a first stage from a start of the
obtaining operation of the page to a time of completion of
acquisition of text data of the page, a second stage from the

time of the completion of acquisition of the text data of the page to a time of completion of acquisition of the definition information, and a third stage after the completion of acquisition of the definition information. In this case, the

5 onscreen representation in the text browsing mode is made during the first stage, notification notifying execution of the switching is added to the onscreen representation in the text browsing mode during the second stage, and the onscreen representation in which the definition information is applied

10 is made during the third stage if the predetermined user operation is not performed.

Still optionally, the operation for canceling the switching of the onscreen representation may be allowed only in the second stage.

15 In a particular case, the operation for canceling the switching of the onscreen representation may be allowed in a certain time period from completion of acquisition of the definition information.

In a particular case, the operation for canceling the

20 switching of the onscreen representation may be allowed in a certain time period between a first time before completion of acquisition of the definition information and a second time after the completion of acquisition of the definition information.

25 In a particular case, the onscreen representation in the text browsing mode may be made during a first stage from a start of the obtaining operation of the page to a time of completion

of acquisition of text data of the page. In this case, the operation for canceling the switching of the onscreen representation is allowed in a certain time period from completion of acquisition of the definition information.

5   Optionally, the operation for canceling the switching of the onscreen representation may not be allowed in the first stage, and operation for canceling acquisition of the data of the page may be allowed in the first stage.

In a particular case, the operation for canceling the
10   switching of the onscreen representation may include at least one of scrolling operation, storing operation and printing operation.

In a particular case, the predetermined user operation may include operation for performing the switching of the
15   onscreen representation. In this case, according to the result of the judging, the switching of the onscreen representation is performed if a result of the judging is that the predetermined user operation is performed, and the switching of the onscreen representation is not performed if a result of the judging is
20   that the predetermined user operation is not performed.

Optionally, the onscreen representation may be controlled in three stages including a first stage from a start of the obtaining operation of the page to a time of completion of acquisition of text data of the page, a second stage from
25   the time of the completion of acquisition of the text data of the page to a time of completion of acquisition of the definition information, and a third stage after the completion of

acquisition of the definition information. In this case, the
onscreen representation in the text browsing mode is made during
the first stage, notification notifying that execution of the
switching is available is added to the onscreen representation
5   in the text browsing mode during the second stage, and the i
onscreen representation in the text browsing mode is continued
during the third stage if the predetermined user operation is
not performed.

Optionally, the operation for performing the switching
10   of the onscreen representation may be allowed in the second and
third stages.

In a particular case, the method may include storing
information regarding a focus position and a scrolling position
in the text browsing mode, and restoring the focus position and
15   the scrolling position, based on the stored information, in a
mode in which the definition information is applied.

Optionally, the restoring may include judging whether or
not the focus position is within a displaying area defined by
the scrolling position, and adjusting the focus position so that
20   the focus position is within the displaying area if it is judged
that the focus position is not within the displaying area.

Optionally, the adjusting the focus position may be
performed so that a scrolling amount from the top of a page is
minimized and a focus target is displayed appropriately.

25   Optionally, the restoring the focus position and the
scrolling position may be performed so that an item adjacent
to the focus position to be restored stored is used as a focus

target in the mode in which the definition information is reflected if it is judged that a focus target in the text browsing mode does not exist at a position to be restored in the mode in which the definition information is reflected.

5   Still optionally, the onscreen representation in the text browsing mode and the onscreen representation in which the definition information is applied may be made based on a same document described by a markup language of the page, and the information regarding the focus position and the scrolling

10   position may be stored in association with the same document.

In a particular case, the definition information may include an external style sheet.

In a particular case, the definition information may include an external script.

15   In a particular case, the obtaining operation for obtaining the page may include (1) judging whether designation of an external style sheet is contained in the page, and obtaining the external style sheet through a network if it is judged that the designation of the external style sheet is

20   contained in the page, and judging whether designation of an external script is contained in the page, and obtaining the external script through the network if it is judged that the designation of the external script is contained in the page.

In a particular case, the method may include continuing

25   obtaining operation for obtaining remaining data of the page and displaying operation for the remaining data of the page after the switching of the onscreen representation is

performed.

According another aspect of the invention, there is provided a method of rendering a page, which includes starting obtaining operation for obtaining a page made by a markup language, and performing a text browsing mode operation on obtained part of data of the page in parallel with the obtaining operation of the page. The method further includes judging whether or not acquisition of the whole data of the page is completed, and switching onscreen representation, depending on a result of the judging, from onscreen representation in a text browsing mode to onscreen representation in which definition information designated in a markup language document of the page and applied to the entire page so as to render the page as designated by the document is applied.

With this configuration, sensuous processing rate of a web page sensible to a user is enhanced while deterioration in displaying quality of the web page is avoided.

According another aspect of the invention, there is provided a method of rendering a page, there is provided a method of rendering a page, which includes starting obtaining operation for obtaining a page made by a markup language, and performing a first mode operation in which an external style sheet obtained by the obtaining operation is applied in onscreen representation in a text browsing mode. The method further includes judging whether or not data of a predetermined number's screenfulls against the page is obtained, and switching onscreen representation, depending on a result of the judging,

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from onscreen representation of the first mode operation to onscreen representation in which definition information designated in a markup language document of the page and applied to the entire page so as to render the page as designated by

5   the document is applied.

With this configuration, sensuous processing rate of a web page sensible to a user is enhanced while deterioration in displaying quality of the web page is avoided.

According another aspect of the invention, there is

10   provided a method of rendering a page, which includes starting obtaining operation for obtaining a page made by a markup language, performing firstly displaying operation on data of the page without using definition information to be applied to the entire page so as to render the page as designated by a markup

15   language document of the page, and performing secondly displaying operation of the data of the page using definition information in the page.

With this configuration, sensuous processing rate of a web page sensible to a user is enhanced while deterioration in

20   displaying quality of the web page is avoided.

According another aspect of the invention, there is provided a method of rendering a page, which includes starting obtaining operation for obtaining a page made by a markup language, and performing operation in a first browsing mode

25   which makes less rich presentation on a screen than a second browsing mode in which an external style sheet and an external script in the page are applied. The method further includes

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judging whether or not acquisition of the external style sheet

and the external script is finished, and switching onscreen

representation, depending on a result of the judging, from

onscreen representation in the first browsing mode to onscreen

5   representation in the second browsing mode.

With this configuration, sensuous processing rate of a

web page sensible to a user is enhanced while deterioration in

displaying quality of the web page is avoided.

According another aspect of the invention, there is

10   provided a method of rendering a page, which includes starting

obtaining operation for obtaining a page made by a markup

language, and performing operation in a first browsing mode

which makes less rich presentation on a screen than a second

browsing mode in which an external style sheet and an external

15   script in the page are applied. The method further includes

judging whether or not data of a predetermined number's

screenfulls against the page is obtained, and switching

onscreen representation, depending on a result of the judging,

from onscreen representation in the first browsing mode to

20   onscreen representation in the second browsing mode.

With this configuration, sensuous processing rate of a

web page sensible to a user is enhanced while deterioration in

displaying quality of the web page is avoided.

According another aspect of the invention, there is

25   provided a method of rendering a page, which includes starting

obtaining operation for obtaining a page made by a markup

language, and performing operation in a first browsing mode

which makes less rich presentation on a screen than a second browsing mode in which an external style sheet and an external script in the page are applied. The method further includes judging whether or not a predetermined time period has elapsed

5   from a start of the obtaining operation, and switching onscreen representation, depending on a result of the judging, from onscreen representation in the first browsing mode to onscreen representation in the second browsing mode.

With this configuration, sensuous processing rate of a

10   web page sensible to a user is enhanced while deterioration in displaying quality of the web page is avoided.

According another aspect of the invention, there is provided a method of rendering a page, which includes starting obtaining operation for obtaining a page made by a markup

15   language, and performing operation in a first browsing mode which makes less rich presentation on a screen than a second browsing mode in which an external style sheet and an external script in the page are applied. The method further includes judging whether or not predetermined user operation is

20   performed, and switching onscreen representation, depending on a result of the judging, from onscreen representation in the first browsing mode to onscreen representation in the second browsing mode.

With this configuration, sensuous processing rate of a

25   web page sensible to a user is enhanced while deterioration in displaying quality of the web page is avoided.

According another aspect of the invention, there is

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provided a method of rendering a page, which includes starting obtaining operation for obtaining a page made by a markup language, and performing operation in a first browsing mode which makes less rich presentation on a screen than a second

5   browsing mode in which an external style sheet and an external script in the page are applied. The method further includes judging whether or not acquisition of the whole data of the page is completed, and switching onscreen representation, depending on a result of the judging, from onscreen representation in the

10   first browsing mode to onscreen representation in the second browsing mode.

With this configuration, sensuous processing rate of a web page sensible to a user is enhanced while deterioration in displaying quality of the web page is avoided.

15   According another aspect of the invention, there is provided a terminal device, which includes a screen on which onscreen representation is formed, a network interface interfacing with a network, and a controller configured to perform functions including:

20   (a) starting obtaining operation for obtaining a page made by a markup language through the network;

(b) performing operation in a first browsing mode which makes less rich presentation on a screen than a second browsing mode in which an external style sheet and an external script

25   in the page are applied;

(c) judging whether or not acquisition of the external style sheet and the external script is finished; and

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(d) switching onscreen representation, depending on a result of the judging, from onscreen representation in the first browsing mode to onscreen representation in the second browsing mode.

5   With this configuration, sensuous processing rate of a web page sensible to a user is enhanced while deterioration in displaying quality of the web page is avoided.

According another aspect of the invention, there is provided a computer program product for use on a terminal device.

10   The computer program product includes a computer program executed to achieve a method of rendering a page. The method includes starting obtaining operation for obtaining a page made by a markup language, performing operation in a first browsing mode which makes less rich presentation on a screen than a second

15   browsing mode in which an external style sheet and an external script in the page are applied, judging whether or not acquisition of the external style sheet and the external script is finished, and switching onscreen representation, depending on a result of the judging, from onscreen representation in the

20   first browsing mode to onscreen representation in the second browsing mode.

With this configuration, sensuous processing rate of a web page sensible to a user is enhanced while deterioration in displaying quality of the web page is avoided.

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BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will be understood and appreciated from the following detailed description, taken in conjunction with the drawings in which:

Fig. 1 is a block diagram of a control system of a terminal
5   device according to an embodiment of the invention;

Fig. 2 is a flowchart illustrating a rendering process of a browser running on the terminal device;

Fig. 3A is a screen image of a web page in a text browsing mode displayed on a screen of the terminal device by the
10   rendering process shown in Fig. 2;

Fig. 3B is a screen image of the normal onscreen representation of the web page displayed on the screen of the terminal device by the rendering process shown in Fig. 2;

Fig. 4 is a flowchart illustrating a rendering process
15   of a conventional browser running on a personal computer;

Fig. 5A shows an example of a screen image in the text browsing mode;

Fig. 5B shows an example of a screen image in the full browsing mode made;

20   Fig. 6A shows a screen image which is displayed on the screen of the terminal device in a stage of a start of the text browsing mode;

Fig. 6B shows a screen image at a stage in which text data in the page is completely obtained and notification notifying
25   that the terminal device is ready for changing to the full browsing mode is also displayed on the screen;

Fig. 6C shows a screen image at a stage in which a browsing

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mode has been changed from the text browsing mode to the full

browsing mode;

Fig. 7 is a timing chart illustrating a progress of a user

selection switching operation #1;

5   Fig. 8A shows a progressive bar in a situation in which

the user selection switching operation #1 is in a first phase;

Fig. 8B shows a progressive bar 92 in a situation in which

the user selection switching operation #1 is at the midpoint

of a second phase;

10   Fig. 8C shows a progressive bar in a situation in which

the user selection switching operation #1 is at the tail end

of the second phase;

Fig. 9 shows an example of a progressive bar having two

colors respectively corresponding to the first phase and the

15   second phase;

Fig. 10A shows a screen image in the first phase in user

selection switching operation #2;

Fig. 10B shows a screen image at a stage in which text

data of a page is completely obtained and notification notifying

20   that screen switching to the full browsing mode will become

possible within a short time is displayed on the screen;

Fig. 10C shows a screen image in a situation in which the

screen switching to the full browsing mode has been performed;

and

25   Fig. 11 is a timing chart illustrating progress of a

variation of the user selection switching operation #1.

DETAILED DESCRIPTION OF THE EMBODIMENT

Hereinafter, an embodiment of the invention will be described with reference to the accompanying drawings.

5   In this description, the terms "style sheet", "script", "page" are defined as follows.

"style sheet": information of a style regarding a markup language document. CSS (cascading style sheet is one example of style sheet)

10   "script": a script of which target of operation is a markup language.

"page": a series of data, included in a markup language document, which is displayed on a screen by a browser.

"text browsing mode": a browsing mode in which a browser forms

15   onscreen representation in accordance with text information in a page without applying external style sheets and external scripts to the page. User operation including anchor selection and scrolling is also possible in the text browsing mode.

The style sheet and the script are categorized as

20   definition information which is to be applied to the entire page so as to render the page as designated by a markup language document of the page.

Fig. 1 is a block diagram of a control system of a terminal device 10 according to an embodiment of the invention. In this

25   embodiment, the terminal device 10 is configured as a mobile phone. As shown in Fig. 1, the terminal device 10 includes a CPU (central processing unit) 3 which operates to control the

overall components in the terminal device 10. The terminal

device 10 further includes a ROM (read only memory) 5, a RAM

(random access memory) 7, a network interface 9, a PC card

interface 16, a display driver 11 and an user interface device

5   I/F 15, which are connected to the CPU 3 via a bus 19.

The CPU 3 is connected with a display 13 via the display

driver 11, and is connected with a user interface device 17 via

the user interface device I/F 15. The user interface device 17

is a key operation unit including an up-down key and numeric

10   keys. Various types of PC cards such as a flash memory card 18

can be inserted into a slot provided in the PC card interface

16.

In the ROM 5, various programs including a browser are

stored. When a user conducts predetermined operation using the

15   user interface device 17, the browse is started. Fig. 2 is a

flowchart illustrating a rendering process of the browser

running on the terminal device 10. The browser has a parser,

a page maker, and a formatter as essential functional blocks.

These functional blocks execute the following processes on the

20   markup language document. The parser parses a logical structure

of the markup language document. The page maker generates a

layout tree containing information regarding a form of

representation defined by each tag. The formatter performs

layout operation using information regarding an actual screen

25   such as a screen width. In the rendering process shown in Fig.

2, functions accomplished by the functional blocks are utilized.

As shown in Fig. 2, the browser firstly starts to obtain an HTML

document of a web page, of which URL (uniform resource locator) is designated by a user, through a network (S101).

Next, in step S102, displaying operation based on the text browsing mode is started. Specifically, in step S102, parsing operation for the HTML document is performed, and thereafter laying out operation for a result of the parsing operation is performed to display onscreen representation based on the text browsing mode. Next, a process for user operation operated on the screen image of the text browsing mode (S201) is performed in parallel with a sequence of processes (S103 through S107) for obtaining data through the network.

In step S201, obtained parts of the HTML document in obtaining process started in step S101 are displayed successively on a screen of the display 13. Further, in step S201, user operation such as anchor selection (pressing of a hyper link) and scrolling operation is accepted and processed. For example, if the user selects one of hyper links on the screen image of the text browsing mode in step S201, control returns to step S101 to start obtaining a selected page (as indicated by an arrow A1 in Fig. 2).

In the sequence of processes of step S103 through S107, the presence or absence of the external data (e.g., an external CSS and an external script) is judged in accordance with the result of the parsing operation of the HTML document. Specifically, in step S103, it is judged whether an external CSS is designated in the HTML document. When the designation of the external CSS is included in the HTML document (S103:YES),

control proceeds to step S104 where the external CSS is obtained

through the network. After the data acquisition in step S104

is finished, control proceeds to step S105. When the designation

of the external CSS is not included in the HTML document

5   (S103:NO), control proceeds to step S105.

In step S105, it is judged whether an external script is

designated in the HTML document. When the designation of the

external script is included in the HTML document (S105:YES),

control proceeds to step S106 where the external script is

10   obtained through the network. After the data acquisition in step

S106 is finished, control proceeds to step S107. When the

designation of the external script is not included in the HTML

document (S105:NO), control proceeds to step S107.

In step S107, it is judged whether or not the data

15   acquisition of the external CSS and the external script

designated in the HTML document under processing is completed.

When the data acquisition is not completed (S107:NO), control

returns to S103 to repeat the data acquisition. When the data

acquisition is completed (S107:YES), control proceeds to step

20   S108.

In step S108, onscreen representation applying the

external CSS and the external script is created and displayed

on the screen. Hereafter, onscreen representation displayed in

step S108 in a manner designated by a markup language (e.g. HTML)

25   of the page is referred to as normal onscreen representation.

Specifically, in step S108, the laying out process for the

obtained page is performed, applying the obtained external CSS

and the external script. Then, onscreen representation of the normal onscreen representation is formed and displayed on the screen. That is, the onscreen representation of the text browsing mode is replaced by the normal onscreen

5 representation.

By initiation of the screen replacement of step S108, the text browsing mode is finished. In step S109, rendering operation for newly obtained parts of the HTML document may be conducted to complete rendering of the overall page. After the

10 rendering in step S109 is finished, the rendering process is terminated.

As can be seen from Fig. 2, firstly the page requested by the user is displayed in the text browsing mode, and then the normal onscreen representation of the requested page is

15 provided when the external data is successfully obtained through the network. In other words, according to the rendering process shown in Fig. 2, the onscreen representation in the text browsing mode is provided for the user until the normal onscreen representation becomes available. It should be noted that,

20 according to the embodiment, onscreen representation (e.g., a so-called wall paper) having no relation with a requested page is not displayed on the screen until the completion of acquisition of the external data. Also, it is noted that onscreen representation in the text browsing mode and the normal

25 onscreen representation are formed by the same HTML document by the browser.

According to the rendering process of the embodiment, the

onscreen representation in the text browsing mode is provided

for the user immediately at a time of initiation of acquisition

of the requested page. This means that the user can start

browsing of a requested URL quickly after designation of the

5   URL through the user interface device 17. Therefore, the

rendering process of the embodiment allows the user to quickly

grasp a general outline of the requested page's contents firstly

and to secondly transfer to another page by anchor selection

if the user wants to browse another page after glancing over

10 the onscreen representation of the text browsing mode of the

requested page.

       After the user enjoys browsing the screen image of the

requested page in the text browsing mode for a while, the normal

onscreen representation is provided for the user. In the

15 following explanation, the external data is frequently

represented by only the external CSS; however, it is understood

that the term external CSS used to represent the external data

may be replaced with the external script. Moreover, CSS is just

one example of style sheet.

20   It is understood from the explanation of the rendering

process mentioned above, sensuous processing rate for rendering

a web page can be enhanced in comparison with a conventional

browser while deterioration of image quality is not caused.

       Figs. 3A and 3B are examples of screen images displayed

25 on the screen (display 13) by the rendering process shown in

Fig. 2. Fig. 3A is a screen image of a web page made in the

text browsing mode (at step S201). Fig. 3B is a screen image

as the normal onscreen representation of the same web page made in step S108. That is, the screen image in the text browsing mode in Fig 3A and the screen image of the normal onscreen representation in Fig. 3B are made based on the same web page.

5   The user can grasp a general outline of the web page viewing the screen image shown in Fig. 3A. Then, the normal onscreen representation shown in Fig. 3B is provided for the user after acquisition of the external data.

In the rendering process shown in Fig. 2, the switching
10   from the indication of the text browsing mode to the normal onscreen representation (hereafter, frequently referred to as representation switching) is made according to whether the external data is completely obtained through the network. That is a criterion "whether or not the external data is completely
15   obtained" is used to decide whether or not to perform the representation switching. As an alternative to such a criterion, one of criteria indicated below may be adopted.

(1) whether or not N (N: a positive integer) screenfuls of data is obtained.

20   (2) whether or not a predetermined time has elapsed.

(3) whether or not predetermined user operation is performed.

(4) whether or not data of the entire web page is obtained.

The criterion (1) "whether or not N (N: a positive integer) screenfuls of data is obtained" will be explained in detail.

25   If the criterion (1) is adopted in the rendering process shown in Fig. 2, it is judged in step S107 whether N screenfuls of data is completely obtained or not. It is noted that one screen

size is a size of the screen of display 13. When it is determined that the N screenfuls of data is obtained (S107:YES), the representation switching is performed in step S108.

Preferably, the number N is two. That is, it is preferable
5   that the representation switching is made when two screenfuls of data of a designated page is obtained through the network. When the number N is two, even if data such as a table, which is described using a <table> tag, having a size more than several screens long is contained in a page, the representation
10   switching is made when two screenfuls of data is acquired without waiting until data of the entire page is acquired through the network.

It should be noted that the size of two screenfuls of data is sufficient and appropriate size for the purpose of user
15   operation such as anchor selection and scrolling. The number N may be a decimal number. For example, the number N may be 2.5.

The criterion (2) "whether or not a predetermined time has elapsed" will be explained in detail. If the criterion (2) is adopted in the rendering process shown in Fig. 2, it is judged
20   in step S107 whether the predetermined time has elapsed from the start of acquisition of the page data in step S101. When it is determined that the predetermined time has elapsed (S107:YES), the representation switching is performed in step S108.

25   The predetermined time may be a time period required typically to obtain the external data, or a time period required typically for a user to grasp a general outline of a page in

the text browsing mode.

The criterion (3) "whether or not predetermined user operation is performed" will be explained in detail. If the criterion (3) is adopted in the rendering process shown in Fig.

5   2, whether or not to switch from the text browsing mode to the normal onscreen representation depends on a user's intention. That is, in this case, it is judged in step S107 whether or not predetermined user operation (using the user interface device 17) is performed.

10   Only when it is determined that the predetermined user operation is performed, the onscreen representation of the text browsing mode is switched to the normal onscreen representation. It is understood that use of the criterion (3) allows a user to switch to the normal onscreen representation only when the

15   user wants to see detailed information (i.e., the normal onscreen representation) of a page after the user brows the onscreen representation of the text browsing mode which is initiated immediately after designation of a URL of the page.

The criterion (4) "whether or not data of the entire web

20   page is obtained" will be explained in detail. If the criterion (4) is adopted in the rendering process shown in Fig. 2, it is judged in step S107 whether or not data of the entire page is obtained. When it is determined that data of the entire page is obtained (S107:YES), the representation switching is

25   performed in step S108.

The above mentioned operation of the browser (i.e., the rendering process) according to the embodiment can be expressed

as providing onscreen representation of the text browsing mode

firstly and thereafter providing the normal onscreen

representation. That is, in the rendering process described

above, onscreen representation of the text browsing mode in

5   which external data is not applied is firstly provided before

providing the normal onscreen representation. However,

onscreen representation provided before providing the normal

onscreen representation is not limited to such onscreen

representation of the text browsing mode defined above.

10   For example, onscreen representation applying only an

external CSS may be provided before providing the normal

onscreen representation in which all of types of external data

is applied. In other wards, the operation of the rendering

process according to the embodiment can be expressed as

15   providing firstly onscreen representation, which is less rich

in presentation than the normal onscreen representation but can

be provided in a relatively short time, and thereafter providing

the normal onscreen representation which requires a relatively

long time to display but is rich in presentation.

20   Further, in the rendering process shown in Fig. 2, the

representation switching is made in two steps (i.e., a step of

the text browsing mode and a step of the normal onscreen

representation). However, the representation switching may be

made in three or more steps. For example, the representation

25   switching may be made so that presentation of a page becomes

richer in three steps.

As can be seen from the above explanation, presentation

30

of a page can be broadly divided into the normal onscreen representation and a less rich onscreen representation (i.e., onscreen representation less rich than the normal onscreen representation) according to whether or not external data

5   (including external image data, external motion picture data, an external style sheet and an external script) is applied. The text browsing mode is included in the less rich onscreen representation.

Hereafter, a browsing mode for the less rich onscreen

10   representation is referred to as "a poor browsing mode", and a browsing mode for the normal onscreen representation is referred to as "a full browsing mode". The poor browsing mode and the full browsing mode are defined as follows.

(1) The poor browsing mode includes the following modes M1 and

15   M2.

(Mode M1) the text browsing mode: in this mode displaying on a screen is performed based on text information of a page without applying an external style sheet and an external script designated in the page as defined above. The user operation such

20   as anchor selection and scrolling is also possible in the text browsing mode. If style sheet data is stored locally in a memory (e.g., the ROM 5) of the terminal device 10 beforehand, such style sheet data may be applied to onscreen representation in the text browsing mode.

25   (Mode M2) a local image and motion picture browsing mode: in this mode an external style sheet and an external script are not applied for text information of a page, but image data and/or

motion picture data stored locally in the terminal device 10 are used for onscreen representation. The user operation such as an anchor selection and scrolling is also possible in the mode M2. The locally stored data (image data or motion picture

5   data) includes data stored in a cache memory of the terminal device 10. The locally stored data includes an alternative icon data, stored in the terminal device 10, which is displayed on the screen image in place of an image to be obtained through the network.

10   As described above, the poor browsing mode is a browsing mode in which an external style sheet and an external script are not applied, and objects (including image data and motion picture data) to be obtained from the network are not displayed. A browsing mode combining the modes M1 and M2 may be categorized

15   as the poor browsing mode.

        The full browsing mode is a browsing mode in which at least an external style sheet and an external script are applied to onscreen representation. That is, substantially complete presentation of a page is attained in this mode.

20   The representation switching may be made such that presentation of a page becomes richer through the text browsing mode M1, the browsing mode M2 and the full browsing mode.

        Hereafter, examples of the representation switching operation based on the criterion (3) described above will be

25   explained. Operation of the following examples relate to changing from a poor browsing mode (including the text browsing mode) to a full browsing mode (including/equal to normal

onscreen representation) depending on a user's intention.

Before explaining the representation switching operation based on the criterion (3), examples of onscreen representation made by the representation switching operation in which the

5 representation switching is made automatically (depending on whether or not the external data is completely obtained) will be explained with reference to Figs. 5A and 5B.

Fig. 5A shows an example of a screen image in the text browsing mode. As shown in Fig. 5A, the screen image is formed

10 on a screen 61 of the terminal device 10 based on the text browsing mode. Fig. 5B shows an example of a screen image in the full browsing mode made. The screen image of Fig. 5B is made automatically when the external data is completely obtained in step S108 in Fig. 2.

15 Figs. 6A through 6C are examples of screen images formed by the representation switching operation in which the representation switching is performed depending on the user's operation based on his intention. Hereafter, the representation switching operation, which is explained below with reference

20 to Figs. 6A through 6C, is referred to as "user selection switching operation #1".

In the user selection switching operation #1, the representation switching from the text browsing mode to the full browsing mode is performed automatically upon completion of

25 acquisition of the external data if user operation for canceling the representation switching to the full browsing mode is not made by the user. Specifically, in this operation #1,

notification notifying that the terminal device 10 is ready for changing to the full browsing mode is displayed on the screen 61 before the representation switching is performed.

That is, in this operation #1, the representation

5   switching to the full browsing mode is automatically made upon completion of acquisition of the external data, but a chance for canceling the representation switching is provided for the user at a stage before execution of the representation switching. The operation #1 has advantages in that it provides a chance

10 for canceling the representation switching to a user who thinks the onscreen representation of the text browsing mode is sufficient.

Figs. 6A through 6C are screen images in the user selection switching operation #1. Fig. 6A shows a screen image which is

15 displayed on the screen 61 of the terminal device 10 in a stage of a start of the text browsing mode. At the stage of Fig. 6A, text data of a page is not completely obtained. In this stage, an "Abort" key 71 assigned as a software key is displayed on the screen 61.

20   Fig. 6B shows a screen image at a stage in which all of the text data in the page is obtained and the notification notifying that the terminal device 10 is ready for changing to the full browsing mode is also displayed on the screen 61. This stage also allows the user to cancel the changing from the text

25 browsing mode to the full browsing mode. In the stage shown in Fig. 6B, the screen image is still in the text browsing mode.

Specifically, in the stage shown in Fig. 6B, a cancel key

72 assigned as the software key is displayed on the screen 61.

The cancel key 72 is used to cancel changing from the text

browsing mode to the full browsing mode (i.e., the

representation switching). That is, if the user operates the

5   cancel key 72, the changing from the text browsing mode to the

full browsing mode is cancelled. Therefore, by operating the

cancel key 72, the user can continue to brows in the text browsing

mode.

As shown in Fig. 6B, notification notifying that the

10   terminal device 10 is ready for changing to the full browsing

mode is also displayed on the screen 61. In the example of Fig.

6B, two types of notification (i.e., an arrow symbol 81 and

indication "changing..." 82) are displayed.

Fig. 6C shows a screen image at a stage in which the

15   browsing mode has been changed from the text browsing mode to

the full browsing mode. In the stage of Fig. 6C, the screen image

is formed in accordance with the full browsing mode.

As described above, the user selection switching

operation #1 is performed through three phases (i.e., three

20   stages of Figs. 6A, 6B and 6C). Fig. 7 is a timing chart

illustrating a progress of the user selection switching

operation #1, in which the stages of Figs. 6A, 6B and 6C are

defined as phases P1, P2 and P3, respectively. Also, in Fig.

7, corresponding of each browsing (phase), each condition of

25   data acquisition, and each software key assigned is shown.

Referring to Figs. 2 and 7, the phases P1, P2 and P3 can

be defined as follows.

Phase P1: This phase corresponds to a stage from the start of acquisition of data of a page at step S101 to completion of acquisition of text data of the page.

Phase P2: This phase corresponds to a stage from the completion

5   of acquisition of the text data of the page to completion of acquisition of external data of the page at step S107.

Phase P3: This phase corresponds to a stage from the normal onscreen representation at step S108.

    Therefore, the phases P1 and P2 correspond to operation

10   of the browser in the text browsing mode. The phase P3 corresponds to operation of the browser in the full browsing mode. A timing t1 at which the phase P1 is switched to the phase P2 corresponds to a timing at which the acquisition of the text data of the page is completed. A timing t2 at which the phase

15   P2 is switched to the phase P3 corresponds to a timing at which acquisition of the external data of the page is completed.

    In the phase P1, acquisition of the text data of the page aborts when the abort key 71 assigned as the software key is operated by the user. In phase P2, the cancel key 72 is assigned

20   as the software key on the screen 61 in place of the abort key 71. As described above, in the phase P2, the user can cancel the representation switching to the full browsing mode by operating the cancel key 72.

    It is understood that the indication of the cancel key

25   72 on the screen 61 in the phase P2 serves the purpose of letting the user know that the representation switching occurs in a short time. As described above, the arrow symbol 81 and the

indication "changing..."82 are also displayed on the screen 61,
by which the fact that the representation switching occurs in
a short time is notified to the user securely.

As shown in Figs. 6C and 7, in the phase P3, a "text" key
5   74 may be assigned as the software key. The text key 74 is used
to return to the text browsing mode from the full browsing mode.

Since the canceling of the representation switching is
allowed in the phase P2 (i.e., before entering the full browsing
mode), the amount of data to be stored in the terminal device
10 10 can be reduced when the user selects the canceling of the
representation switching.

A progressive bar (not shown in Figs. 6A through 6C) may
be displayed on the screen 61 to show the progress of the user
selection switching operation #1. Figs. 8A through 8C show
15 examples of progressive bars to be displayed on the screen 61.
Specifically, a progressive bar 91 in Fig. 8A shows a situation
in which the operation #1 is in the phase P1. The length of the
progressive bar increases with the progress of the operation
#1 as shown in Figs. 8B and 8C. A progressive bar 92 in Fig.
20 8B shows a situation in which the operation #1 is at the midpoint
of the phase P2, and a progressive bar in Fig. 8C shows a
situation in which the operation #1 is at the tail end of the
phase P2.

A color of the progressive bar may be changed between the
25 phase P1 and the phase P2. In the examples of Figs. 8A through
8C, the progressive bar 91 in the phase P1 is displayed in a
first color (or a first hatching pattern), and the progressive

bar 92 (and 93) in the phase P2 is displayed in a second color
(or a second hatching pattern) different from the first color
(the first hatching pattern), by which the user can securely
recognize a change of the phase.

5   Variations of the user selection switching operation #1
can be made as follows. Hereafter, five variations A1 through
A5 of the user selection switching operation #1 will be
described.

        [Variation A1]

10   In the variation A1, the indication "changing..." 82
flashes after the acquisition of the external data is completed.
The operation of the cancel key 72 is allowed for a predetermined
time period from the completion of the acquisition of the
external data (i.e., from the timing t2). After the

15 predetermined time period has elapsed from the completion of
the acquisition of the external data, the representation
switching to the full browsing mode is performed automatically
unless the user operation of the cancel key 72 is done by the
user.

20   The cancellation of the representation switching may be
inhibited in the phase P2. Preferably, in this case, the
indication "changing..." 82 is not displayed on the screen 61 in
the phase P2, and the indication "changing..." 82 is only
displayed (i.e., blinked) in the above mentioned predetermined

25 time period from the timing t2.

        Alternatively, the cancellation of the representation
switching may be also allowed in the phase P2. Preferably, in

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this case, the indication "changing..." 82 is also displayed on the screen 61 in the phase P2.

Fig. 11 is a timing chart illustrating progress of the variation A1, in which the stages of Figs. 6A, 6B and 6C are

5   defined as phases P1, P2 and P3, respectively. Similarly to Fig. 7, in Fig. 11, the browsing mode, the condition of data acquisition, and assigning of the software key are also shown.

As shown in Fig. 11, in the variation A1, the indication "changing..." 82 flashes for the predetermined time period (e.g.,

10   two seconds) from the completion of acquisition of the external data (i.e., from the timing t2) to accept the cancellation of the representation switching. In Fig. 11, a phase during the predetermined time period is defined as a phase P2.5. In phase P2.5, the screen image based on the text browsing mode is

15   displayed on the screen 61.

After a lapse of the predetermined time period (i.e., at a timing t3), the representation switching is performed to enter the phase P3. The variation A1 is very convenient for a user because the variation A1 allows the user to securely cancel the

20   representation switching, for example, when the user finds a desired link on the screen image of the text browsing mode immediately before the changing from the text browsing mode to the full browsing mode. The variation A1 may operate in the phase P2.5 so that the arrow symbol 81 also flashes together with the

25   flashing of the indication "changing..." 82. Alternatively, the variation A1 may operate so that only the arrow symbol 81 flashes.

[Variation A2]

In the variation A2, the canceling of the representation
switching is allowed in the whole span of the phase P2 as in
the case of the user selection switching operation #1 shown in

5   Fig. 7, and the indication "changing…" 82 is displayed on the
screen 61 only for a certain time period immediately before the
timing of the completion of acquisition of the external data
(i.e., the timing t2). For example, the indication "changing…"
82 may be displayed in the phase P2 in a range of the progress

10 of the external data acquisition of about 95% to 100%.

By the configuration of the variation A2, it becomes
possible to securely notify the user of the change of the
browsing mode.

[Variation A3]

15   In this variation A3, the indication "changing…" 82 is
displayed from a timing immediately before the completion of
the external data acquisition (i.e., the timing t2) to a timing
immediately after the timing t2. That is, a time period allowing
the canceling of the representation switching is started at the

20 timing immediately before the completion of the external data
acquisition, and continues for a while from the completion of
the external data acquisition.

[Variation A4]

In the variation A4, a key (e.g. a "change" key) is

25 displayed on the screen 61 as a software key after the user
operates the cancel key 72 to cancel the representation
switching to the full browsing mode. The "change" key is used

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to instruct the browser to change to the full browsing mode.
The variation A4 may be additionally performed together with,
for example, each of the variations A1, A2 and A3.

[Variation A5]

5   In the variation A5, the abort key 71 is displayed on the
screen 71 until the completion of the external data acquisition
(i.e., until the timing t2), and the cancel key 72 is not
displayed. That is, operation of the abort key 71 is accepted
until the timing t2. By the abort key 71, acquisition of text

10   data of a page is stopped.

The variation A5 may be used in combination with the
variation A1. In such a case, the abort of the acquisition of
the text data is accepted until the timing t2, and the indication
"changing…" 82 flashes for the predetermined time (i.e., two

15   seconds) from the timing t2 to accept the canceling of the
representation switching.

In the example of the screen image in Fig. 6B, the letters
"Cancel" are displayed as the cancel key 72. However, letters
"Text" may be displayed as the cancel key 72 in place of the

20   letters "Cancel" since the cancel key 72 has the function of
continuing the text browsing mode.

It should be noted that the progressive bars of Figs. 8A
through 8C are shown by way of illustration. Various types of
presentations of progressive bars for notifying the user of

25   progress of the phase and progress of data acquisition are also
possible. Fig. 9 shows one of such variations of presentation
of the progressive bar. In the example of Fig. 9, the progressive

bar has a plurality of portions having different colors

respectively corresponding to a plurality of phases. That is,

in the example of Fig. 9, the progressive bar is formed by two

portions having different colors respectively corresponding to

5   the phases P1 and P2.

As an alternative to displaying the progressive bar, an

icon may be displayed on the screen 61 to indicate progress of

the phase by, for example, rotation of the icon or switching

of color of the icon.

10   With regard to the variation A1, the progressive bar

described above may be displayed on the screen 61 during the

phase P2 and the phase P2.5 in which the indication "changing..."

82 flashes. In this case, the progressive bar may be displayed

such that a color (or a hatching pattern) of a part of the

15   progressive bar corresponding to the phase P2.5 is changed from

a color (or a hatching pattern) of a part of the progressive

bar corresponding to the phase P2.

Fig. 10A through 10C are other examples of screen images

made by the representation switching operation performed

20   depending on the user's operation based on his intention. The

representation switching operation explain below with

reference to Figs. 10A through 10C is referred to as "user

selection switching operation #2".

In the user selection switching operation #2, the

25   notification notifying the user that the browser is ready for

performing the representation switching is displayed on the

screen 61, but the representation switching is not performed

(i.e., the text browsing mode is not changed to the full browsing mode) if the user's command is not inputted to the terminal device 10.

Similarly to the user selection switching operation #1
5   shown in Figs. 6A through 6C, Fig. 10A shows a screen image in the phase P1. In the stage of Fig. 10A, the onscreen representation in the text browsing mode is formed on the screen 61. In this stage of Fig. 10A, text data of a page is not completely obtained. In this stage, the "Abort" key 71 assigned
10   as a software key is displayed on the screen 61 to allow the user to abort the acquisition of text data of the page.

Fig. 10B shows a screen image at a stage in which the text data of the page is completely obtained and the notification notifying that the representation switching to the full
15   browsing mode will become possible within a short time (or the notification notifying that the representation switching has become possible) is displayed on the screen 61. Also, on the screen 61, an operation key (e.g., a software key) which allows the user to switch to the full browsing mode is displayed.

20   As described above, if the user makes no operation in the phase P2 (on the screen 61 of Fig. 10B), the representation switching from the text browsing mode to the full screen mode is not performed. Specifically, in the phase P2, a "Change" key 73 is displayed as a software key (see Fig. 10B). The "Change"
25   key 73 is used to instruct the browser (the terminal device 10) to change to the full browsing mode. If the "Change" key 73 is not operated, the representation switching to the full browsing

mode is not performed. The arrow symbol 81 and the indication

"changing..." 82 function as the notification notifying that the

representation switching to the full browsing mode will become

possible within a short time.

5   Fig. 10C shows a screen image in a situation in which the

representation switching to the full browsing mode has been

performed. That is, Fig. 10C is the screen image in the full

browsing mode after the user operates the "Change" key 73.

         As a variation, the user selection switching operation

10   #2 may be configured such that the representation switching by

the "Change" key 73 is allowed at any desired time after the

external data is completely obtained. This configuration is

convenient for the user particularly in a situation in which

the user wants to change the browsing mode to the full browsing

15   mode after browsing the page in the text browsing mode for a

while.

         Alternatively, the "Change" key 73 may be displayed on

the screen 61 for a predetermined time period from completion

of acquisition of the external data. In this case, the user can

20   not change the browsing mode to the full browsing mode if the

user does not press the "Change" key 73 within the predetermined

time period. Another operation key may be assigned as a software

key to allow the user to instruct the browser to change to the

full browsing mode.

25   In each of the user selection switching operation #1 and

the user selection switching operation #2, a software key for

returning to the text browsing mode may be provided after the

representation switching to the full browsing mode is made. Such

a software key may be a "Text" key 74 as shown in Figs. 6C and

10C.

As described above, in the user selection switching

5   operation #1 shown in Figs . 6A through 6C, the representation

switching from the text browsing mode to the full screen mode

is cancelled by the operation of the cancel key 72. As an

alternative to such a configuration, the canceling of the

representation switching may be made when predetermined

10   operation such as scrolling operation, storing operation or

printing operation is conducted by the user in the text browsing

mode because such predetermined operation made during the text

browsing mode can be considered as action indicating that the

user does not want the representation switching from the text

15   browsing mode to the full browsing mode.

Alternatively, if the predetermined operation such as

scrolling operation, storing operation or printing operation

is conducted by the user in the text browsing mode, accepting

of the canceling of the representation switching (i.e., to make

20   the indication "changing…" 82 flash at the timing in the

vicinity of the completion of the external data acquisition as

in the case of the variations A1 and A2) may be extended. For

example, the allowing of the canceling of the representation

switching may be extended until the predetermined operation by

25   the user is finished.

It is noted that, in each of the user selection switching

operation #1 and the user selection switching operation #2, a

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user interface for inputting a command about whether or not to

change the browsing mode is not a modal dialog such as a dialog

box. That is, the user interface according to the embodiment

is not a dialog box which disenables operation other than

5   operation for the dialog box. Therefore, according to the

embodiment, the user operation for selecting or canceling the

mode switching is very simple for the user. Consequently,

usability in browsing web pages can be enhanced.

In addition to the above mentioned configuration of the

10   browser (i.e., the rendering process), the browser may have the

function of recovering a focus position and/or a scroll position

as described below. Hereafter, the function of recovering the

focus position and the scroll position of the browser provided

at the timing of the representation switching is explained.

15   In the text browsing operation (e.g., in the screen image

shown in Fig. 5A) or in the full browsing operation (e.g., in

the screen image shown in Fig. 5B), a focus (a cursor indicating

the user's present attention in the page) is located on one of

anchor selection targets and objects to be targeted for sending

20   operation, storing operation, printing operation and the like.

The user moves or selects the focus by use of the user interface

device 17 so as to conduct anchor selection of a link or to start

data transmission.

The browser controls the focus position and the scroll

25   position by relating these positions to data of the text

browsing mode or data of the full browsing mode. The browser

stores the focus position (i.e., a focus target on which the

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focus is to be located) and the scroll position by relating these

positions to an HTML document. The scroll position is a

reference position of scrolling that defines a displaying area

in the page. Examples of the scroll position stored in the

5   terminal device 10 are the top position, the midpoint position

or the bottom position corresponding to the HTML document.

More specifically, the browser stores the focus position

or the scroll position, for example, as the number of bytes from

the top of the HTML document, or the number of rows or columns

10   from the top position of the HTML document, so that the focus

position and the scroll position are related to the HTML

document. When the browsing mode is switched from the text

browsing mode to the full browsing mode, the browser stores the

focus position and the scroll position of the onscreen

15   representation in the text browsing mode, and restores the focus

position and the scroll position on the onscreen representation

of the full browsing mode based on the stored information which

is related the HTML document. That is, the browser determines

an object to be assigned the focus and the scroll position based

20   on the stored information, and then forms onscreen

representation to be displayed within the displaying area. As

the onscreen representation in the text(poor) browsing mode and

the normal onscreen representation in the full browsing mode

are formed by the same HTML document, referring the stored

25   position of focus and/or the stored scroll corresponding to the

HTML document enables to restore the focus position and scroll

position, which a user selected in the text browsing mode, in

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the onscreen representation in the full browsing mode.

If the focus target is not included in the displaying area

defined by the scroll position, the screen image may be formed

to include the focus position (i.e., the focus position may have

5   higher priority than the scroll position in regard to the

formation of a screen image based on the stored information).

For example, the scroll position may be adjusted so that the

focus position is located at the center of the displaying area.

Preferably, the scroll position may be adjusted so that

10   a scrolling amount from the top of a page is minimized and a

focus target is displayed appropriately. If a focus target

(designated by the focus position) stored in the text browsing

mode can not be used as a target to display in the full browsing

mode or a focus target in the full browsing mode, displaying

15   operation in the full browsing mode may be performed so that

an item (an object) adjacent to the stored focus position may

be used as a focus target in the full browsing mode. For example,

if a focus position is stored as the number of bytes from the

top of a page, an item (an object) having the minimum number

20   of bytes (i.e. having a minimum distance) from the focus target

(designated by the stored focus position) may be used as a focus

target in the full browsing mode.

Such a situation occurs when a focus is located, for

example, on an anchor or a form element in descendants of a

25   <noscript> element (which is an element defining information

displayed only when a browser does not support scripts), or on

an anchor or a form element which is assigned invisible

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attributes (i.e. "display:none" or "visibility:hidden") by a
CSS. The reason why the above mentioned situation occurs is that
since an external script and an external CSS are not applied
in onscreen representation in the text browsing mode, an item
5   (an object), which can not be used as a focus target in the full
browsing mode, can be used as a focus target in the text browsing
mode. That is because those are not displayed or hidden in the
full browsing mode. Further, if a focus position is stored as
the number of bytes from the top of a page, an item located at
10 a front side of a position corresponding to the stored byte
number (i.e. stored a focus position) or an item located at a
rear side of a position corresponding to the stored byte number
may be used as a focus target in the full browsing mode.

As described above, since the focus position and the
15 scroll position of the browsing mode before the representation
switching are stored being correspond to an HTML document, the
focus position and the scroll position can be restored after
the browsing mode is automatically changed from the text
browsing mode to the full browsing mode. It is understood that
20 the user can continue browsing smoothly even if the
representation switching is made because according to the
configuration of the browser the focus position and the scroll
position are restored.

If the browser is not configured to restore the focus
25 position and the scroll position, troublesome operation is
needed, for example, to move a focus, which may be located at
a position on a screen of a next browsing mode different from

an original position of a focus designated on representation of a previous browsing mode, to its previous position on the screen of a next browsing mode.

It is understood that the restoring of the focus position and the scroll position may be performed when the browsing mode is changed from the full browsing mode to the text browsing mode or may be performed at every browsing mode switching.

The restoring of the focus position and the scroll position may be executed in combination with one of the user selection switching operation #1 and the user selection switching operation #2. Consequently, the usability is enhanced in regard to browsing operation.

Although the present invention has been described in considerable detail with reference to certain preferred embodiments thereof, other embodiments are possible.

In the above mentioned embodiment, a web page made by an HTML is subjected to the rendering process according to the embodiment. However, the embodiment may be modified to process pages made by various types of markup languages including SMIL (Synchronized Multimedia Integration Language), SVG (Scalable Vector Graphics) and XML (eXtensible Markup Language).

In the above mentioned embodiment, the rendering process is executed by a mobile phone. However, the rendering process according to the embodiment may also be executed by various types of terminal devises such as a PDA, a vehicle-installed device and a network-connected home appliance. Also, the rendering process according to the embodiment may be executed

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by a computer having relatively high performance such as a

personal computer. It is understood the above mentioned

advantages of the embodiment are also attained when the

rendering process according to the embodiment is applied to the

5   above mentioned various types of devices.